WHAT IS CLAIMED IS:

1. A stator assembly comprising:

a plurality of stator coil assemblies; and

a stator coil support structure constructed of a non-magnetic, thermally-conductive material, said stator coil support structure including:

an axial passage for receiving a rotor assembly; and

a plurality of channels positioned radially about said axial passage, each said channel being configured to receive one or more of said stator coil assemblies.

2. The stator assembly of claim 1 wherein each said stator coil assembly is surrounded by a ground plane assembly.

3. The stator assembly of claim 1 further comprising a magnetic annular assembly surrounding said stator coil support structure, wherein said magnetic annular assembly includes a plurality of axial coolant passages.

4. The stator assembly of claim 3 further comprising a coolant circulation system for circulating a cooling liquid through said axial coolant passages.

5. The stator assembly of claim 1 wherein said non-magnetic, thermally conductive material is a sheet material, said sheet material being laminated to form said stator coil support structure.

6. The stator assembly of claim 5 wherein said sheet material is a polymer-based adhesive.

7. The stator assembly of claim 5 wherein said sheet material a graphite-based material.

8. The stator assembly of claim 1 further comprising an epoxy filler disposed between said stator coil assemblies and said stator coil support structure.

9. A superconducting rotating machine comprising:

a stator assembly including a plurality of stator coil assemblies, and a stator coil support structure constructed of a non-magnetic, thermally-conductive material, said stator coil support structure including:

an axial passage for receiving a rotor assembly; and

a plurality of channels positioned radially about said axial passage, each said channel being configured to receive one or more of said stator coil assemblies; and

a rotor assembly configured to rotate within said stator assembly, said rotor assembly including an axial shaft, and at least one superconducting rotor winding assembly.

10. The superconducting rotating machine of claim 9 wherein each said stator coil assembly is surrounded by a ground plane assembly.

11. The superconducting rotating machine of claim 9 wherein said stator assembly further includes a magnetic annular assembly surrounding said stator coil support structure, wherein said magnetic annular assembly includes a plurality of axial coolant passages.

12. The superconducting rotating machine of claim 11 further comprising a coolant circulation system for circulating a cooling liquid through said axial coolant passages.

13. The superconducting rotating machine of claim 9 wherein said non-magnetic, thermally conductive material is a sheet material, said sheet material being laminated to form said stator coil support structure.

14. The superconducting rotating machine of claim 13 wherein said sheet material is a polymer-based adhesive.

15. The superconducting rotating machine of claim 13 wherein said sheet material is a graphite-based material.

16. The superconducting rotating machine of claim 9 further comprising an epoxy filler disposed between said stator coil assemblies and said stator coil support structure.

17. The superconducting rotating machine of claim 9 wherein said at least one superconducting rotor winding assembly is constructed using a high-temperature, superconducting material.

18. The superconducting rotating machine of claim 17 wherein said high temperature, superconducting material is chosen from the group consisting of: thallium-barium-calcium-copper-oxide; bismuth-strontium-calcium-copper-oxide; mercury-barium-calcium-copper-oxide; and yttrium-barium-copper-oxide.

19. The superconducting rotating machine of claim 9 further comprising a refrigeration system for cooling said at least one superconducting rotor winding assembly.

20. A method of manufacturing a stator coil support structure comprising:

forming a non-magnetic, thermally conductive cylindrical structure;

forming a plurality of axial channels radially about the non-magnetic, thermally conductive cylindrical structure; and

positioning one or more stator coil assemblies in each of the channels.

21. The method of claim 20 wherein said forming a non-magnetic, thermally conductive cylindrical structure includes laminating multiple layers of a non-magnetic, thermally conductive sheet material to form the non-magnetic, thermally conductive cylindrical structure.

22. The method of claim 20 wherein said forming a non-magnetic, thermally conductive cylindrical structure includes casting a non-magnetic, thermally conductive material to form the non-magnetic, thermally conductive cylindrical structure.

23. The method of claim 20 further comprising:

providing a plurality of axial coolant passages in the non-magnetic, thermally conductive cylindrical structure.

24. The method of claim 20 further comprising:

depositing an epoxy filler between the stator coil assemblies and the non-magnetic, thermally conductive cylindrical structure.

25. A method of manufacturing a stator coil support structure comprising:

forming a non-magnetic, thermally conductive cylindrical structure;

forming a plurality of axial slots radially about the non-magnetic, thermally conductive cylindrical structure;

inserting into each axial slot a heat-sinking member, thus forming a channel between each pair of adjacent heating-sinking members; and

positioning one or more of the stator coil assemblies in each of the channels.

26. The method of claim 25 wherein said forming a non-magnetic, thermally conductive cylindrical structure includes laminating multiple layers of a non-magnetic, thermally conductive sheet material to form the non-magnetic, thermally conductive cylindrical structure.

27. The method of claim 25 wherein said forming a non-magnetic, thermally conductive cylindrical structure includes casting a non-magnetic, thermally conductive material to form the non-magnetic, thermally conductive cylindrical structure.

28. The method of claim 25 further comprising:

providing a plurality of axial coolant passages in the non-magnetic, thermally conductive cylindrical structure.

29. The method of claim 25further comprising:

depositing an epoxy filler between the stator coil assemblies and the non-magnetic, thermally conductive cylindrical structure.

30. A stator assembly comprising:

a plurality of stator coil assemblies;

a magnetic annular assembly; and

a plurality of non-magnetic, thermally-conductive heat sinking members positioned radially about said magnetic annular assembly, thus forming a plurality of channels, each being configured to receive one or more of said stator coil assemblies.

31. The stator assembly of claim 30 wherein said magnetic annular assembly includes a plurality of axial coolant passages.

32. The stator assembly of claim 31 further comprising a coolant circulation system for circulating a cooling liquid through said axial coolant passages.

33. The stator assembly of claim 30 wherein said non-magnetic, thermally-conductive heat sinking members are constructed of a non-magnetic, thermally conductive sheet material, wherein said sheet material is laminated to form said non-magnetic, thermally-conductive heat sinking members.

34. The stator assembly of claim 33 wherein said sheet material is a polymer-based adhesive.

35. The stator assembly of claim 33 wherein said sheet material a graphite-based material.

36. The stator assembly of claim 30 further comprising an epoxy filler disposed between said stator coil assemblies and said non-magnetic, thermally-conductive heat sinking members.

37. A method of manufacturing a stator coil support structure comprising:

forming a magnetic annular assembly;

forming a plurality of non-magnetic, thermally-conductive heat sinking members;

positioning the heat-sinking members radially about the magnetic annular assembly, thus forming a channel between each pair of adjacent heating-sinking members; and

positioning one or more of the stator coil assemblies in each of the channels.

38. The method of claim 37 wherein said forming a plurality of non-magnetic, thermally conductive heat-sinking members includes laminating multiple layers of a non-magnetic, thermally conductive sheet material to form the non-magnetic, thermally conductive heat-sinking members.

39. The method of claim 37 wherein said forming a plurality of non-magnetic, thermally conductive heat-sinking members includes casting a non-magnetic, thermally conductive material to form the non-magnetic, thermally conductive heat-sinking members.

40. The method of claim 37 further comprising providing a plurality of axial coolant passages in the magnetic annular assembly.

41. The method of claim 37 further comprising depositing an epoxy filler between the stator coil assemblies and the non-magnetic, thermally conductive heat-sinking members.